

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A development apparatus, comprising:
 - a housing including a developer supplying/collecting unit and a developer stirring unit arranged in a front-and-rear direction and a projecting portion, the developer supplying/collecting unit and the developer stirring unit together forming a circular passage for carrying a two-component developer including a toner and a carrier;
 - a developer carrying member arranged at a front side portion of the developer supplying/collecting unit to face an image carrying member with respect to a development region;
 - a developer supplying/collecting section for carrying the developer in a rotation axis direction, the developer supplying/collecting section arranged at a rear side portion of the developer supplying/collecting unit to face the developer carrying member and to extend along a rotation axis direction of the developer carrying member;
 - a first developer stirring section and a second developer stirring section arranged in a front-and-rear direction in the developer stirring unit to face each other and to extend along a rotation axis direction of the developer supplying/collecting section, the first and second developer stirring sections having peripheries that rotate and move the developer from an upstream side to a downstream side in a first developer carrying direction in the developer stirring unit; and

a toner supply opening formed above a position where the first and second developer stirring sections face each other in the projecting portion and at the upstream side in the first developer carrying direction in the developer stirring unit,

wherein the first developer carrying direction in the developer stirring unit is substantially opposite to a second developer carrying direction in the developer supplying/collecting section, [[and]]

wherein an amount of the developer carried by the first and second developer stirring sections is equal to an amount of the developer carried by the developer supplying/collecting section, and

wherein the projecting portion projects outwardly in an axial direction from an end portion of the developer carrying member and supports end portions of the developer supplying/collecting section and the first and second developer stirring sections.

2. (Previously presented) The apparatus of claim 1, wherein the first developer stirring section carries the developer in a direction opposite to a direction in which the developer supplying/collecting section carries the developer,

wherein an amount of the developer carried by the first developer stirring section in the rotation axis direction is equal to the amount of the developer carried by the developer supplying/collecting section, and

wherein the second developer stirring section carries substantially no developer in the rotation axis direction.

3. (Previously presented) The apparatus of claim 2, wherein the second developer stirring section is arranged at a rear side portion with respect to the developer supplying/collecting unit.

4. (Previously presented) The apparatus of claim 3, wherein the toner has a volume average particle diameter of 3 μm to 5 μm , and the carrier has a volume average particle diameter of 5 x Dt (μm) to 10 x Dt (μm).

5. (Previously presented) The apparatus of claim 2, wherein the developer supplying/collecting section includes a first stirring member which extends spirally in the rotation axis direction throughout an outer periphery of a first shaft member, and the first stirring section includes a second stirring member which extends spirally in the rotation axis direction throughout an outer periphery of a second shaft member, the second stirring member carrying the developer in a direction opposite to a direction in which the developer supplying/collecting section carries the developer,

wherein an amount of the developer carried by the second stirring member in the rotation axis direction is equal to the amount of the developer carried by the developer supplying/collecting section, and

wherein the second developer stirring section includes a plurality of plate-like stirring members with a third shaft member passing through, the plurality of stirring members inclined in a same direction with respect to the third shaft member, and carries substantially no developer in the rotation axis direction.

6. (Previously presented) The apparatus of claim 5, wherein the second developer stirring section is arranged at a rear side portion with respect to the developer supplying/collecting unit.

7. (Previously presented) The apparatus of claim 6, wherein the toner has a volume average particle diameter of 3 μm to 5 μm , and the carrier has a volume average particle diameter of 5 x Dt (μm) to 10 x Dt (μm).

8. (Previously presented) The apparatus of claim 2, wherein the developer supplying/collecting section includes a first stirring member which extends spirally in the rotation axis direction throughout an outer periphery of a first shaft member, and the first developer stirring section includes a second stirring member which extends spirally in the rotation axis direction throughout an outer periphery of a second shaft member, the second stirring member carrying the developer in a direction opposite to a direction in which the developer supplying/collecting section carries the developer,

wherein an amount of the developer carried by the second stirring member in the rotation axis direction is equal to the amount of the developer carried by the developer supplying/collecting section, and

wherein the second developer stirring section includes a third stirring member having a rib formed on an outer periphery of a third shaft member, and carries substantially no developer in the rotation axis direction.

9. (Previously presented) The apparatus of claim 8, wherein the second developer stirring section is arranged at a rear side portion with respect to the developer supplying/collecting unit.

10. (Previously presented) The apparatus of claim 9, wherein the toner has a volume average particle diameter of 3 μm to 5 μm , and, the carrier has a volume average particle diameter of 5 x Dt (μm) to 10 x Dt (μm).

11. (Withdrawn) The apparatus of claim 1, wherein both the two developer stirring sections in the developer stirring unit carry the developer in a direction opposite to a direction in which the developer supplying/collecting section carries the developer, and have the developer carrying capability so as to make the sum total of the developer carrying amount by the two developer stirring sections in the rotation axis direction equal to that by the developer supplying/collecting section.

12. (Withdrawn) The apparatus of claim 11, wherein one of the two developer stirring sections in the developer stirring unit has the developer carrying capability in the rotation axis direction lower than or equal to that of another developer stirring section, and is placed at a rear side with respect to the developer supplying/collecting unit.

13. (Withdrawn) The apparatus of claim 12, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm

to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

14. (Withdrawn) The apparatus of claim 11, wherein
the developer supplying/collecting section comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,
one of the two developer stirring sections comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,
and
another developer stirring section comprises a plurality of semioval first stirring members and a plurality of semioval second stirring members on an outer periphery of a shaft member, the plurality of first stirring members being placed along a first stirring member arrangement plane, the plurality of second stirring members being placed along a second stirring member arrangement plane, the first stirring member arrangement plane and the second stirring member arrangement plane being inclined in different directions from each other with respect to a plane perpendicular to the shaft member.

15. (Withdrawn) The apparatus of claim 14, wherein another developer stirring section in the developer stirring unit has the developer carrying capability in the rotation axis direction equal to or lower than that of the one developer stirring section, and is placed at a rear side with respect to the developer supplying/collecting unit.

16. (Withdrawn) The apparatus of claim 15, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

17. (Withdrawn) The apparatus of claim 11, wherein
the developer supplying/collecting section comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,
one of the two developer stirring sections comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,
and
another developer stirring section comprises a stirring member comprising a rib placed on an outer periphery of a shaft member or at a position with being apart from each other with respect to the shaft member in a radial direction so as to extend along the rotation axis direction.

18. (Withdrawn) The apparatus of claim 17, wherein another developer stirring section in the developer stirring unit has the developer carrying capability in the rotation axis direction equal to or lower than that of the one developer stirring section, and is placed at a rear side with respect to the developer supplying/collecting unit.

19. (Withdrawn) The apparatus of claim 18, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm

to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

20. (Withdrawn) The apparatus of claim 1, wherein

one of the two developer stirring sections in the developer stirring unit carries the developer in a same direction as a direction in which the developer supplying/collecting section carries the developer, and has the developer carrying capability in the rotation axis direction lower than that of the developer supplying/collecting section, and

another developer stirring section carries the developer in a direction opposite to a direction in which the developer supplying/collecting section carries the developer, and has the developer carrying capability so as to make the developer carrying amount by another developer stirring section equal to the sum total of that by the developer supplying/collecting section and the one developer stirring section.

21. (Withdrawn) The apparatus of claim 20, wherein, in the developer stirring unit, another developer stirring section having higher developer carrying capability is placed at a rear side with respect to the developer supplying/collecting unit.

22. (Withdrawn) The apparatus of claim 21, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

23. (Withdrawn) The apparatus of claim 20, wherein

the developer supplying/collecting section comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,

the one of the two developer stirring sections having lower developer carrying capability, comprises a plurality of semioval first stirring members and a plurality of oval-semioval second stirring members on an outer periphery of a shaft member, the plurality of first stirring members being placed along a first stirring member arrangement plane, the plurality of second stirring members being placed along a second stirring member arrangement plane, the first stirring member arrangement plane and the second stirring member arrangement plane being inclined in different directions from each other with respect to a plane perpendicular to the shaft member, and has the developer carrying capability in the rotation axis direction lower than that of the developer supplying/collecting section, and

another developer stirring section having higher developer carrying capability, comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member, and has the developer carrying capability so as to make the developer carrying amount by another developer stirring section equal to the sum total of that by the developer supplying/collecting section and the one developer stirring section.

24. (Withdrawn) The apparatus of claim 23, wherein, in the developer stirring unit, another developer stirring section having higher developer carrying capability is placed at a rear side with respect to the developer supplying/collecting unit.

25. (Withdrawn) The apparatus of claim 24, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

26. (Withdrawn) The apparatus of claim 20, wherein
the developer supplying/collecting section comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member,
the one of the two developer stirring sections having lower developer carrying capability, comprises a stirring member comprising a rib placed on an outer periphery of a shaft member or at a position with being apart from each other with respect to the shaft member in a radial direction so as to extend along the rotation axis direction, and has the developer carrying capability in the rotation axis direction lower than that of the developer supplying/collecting section, and

another developer stirring section comprises a stirring member extending spirally in the rotation axis direction throughout an outer periphery of a shaft member, and has the developer carrying capability so as to make the developer carrying amount by another developer stirring section equal to the sum total of that by the developer supplying/collecting section and the one developer stirring section.

27. (Withdrawn) The apparatus of claim 26, wherein, in the developer stirring unit, another developer stirring section having higher developer carrying capability is placed at a rear side with respect to the developer supplying/collecting unit.

28. (Withdrawn) The apparatus of claim 27, wherein the two-component developer is composed of the toner having a volume average particle diameter of 3 μm to 5 μm , and, denoting the volume average particle diameter of the toner by D_t (μm), the carrier having volume average particle diameter of 5 x D_t to 10 x D_t .

29. (Previously presented) An image formation apparatus, comprising:
an image carrying member; and
a toner image formation section for forming a toner image by developing an electrostatic image formed on the image carrying member,
wherein the toner image formation section includes the development apparatus of claim 1, and

wherein the following conditions (1) and (2) are satisfied:

$$\text{Condition (1);} \quad W \geq M H V H L / 1000$$

$$\text{Condition (2);} \quad R \leq 600$$

where V represents a moving speed (mm/sec) of the image carrying member, M represents a maximum toner amount attaching to one unit area in the toner image formed on the image carrying member (mg/cm^2), L represents a maximum width (mm) of the toner image formed on the image carrying member in a direction perpendicular to a moving direction of the image carrying member, W represents a developer carrying amount (g/sec) by the developer supplying/collecting section in the rotation axis direction, and R represents a rotation number of the developer supplying/collecting section.

30. (Previously presented) An image formation apparatus, comprising:

- an image carrying member;
- a toner image formation section for forming a toner image by developing an electrostatic image formed on the image carrying member;
- a transferring section for transferring the toner image on the image carrying member to a transferring material or an intermediate transferring member;
- a cleaning section for removing toner which remains on the image carrying member after the toner image is transferred; and
- a toner recycling section for collecting the toner removed from the image carrying member to be reused,

wherein the toner image formation section includes the development apparatus of claim 1, and

wherein in the housing of the development apparatus, a recycled toner mixing opening is formed above the position where the first and second developer stirring sections face each other and at the upstream side with respect to the toner supplying opening in the first developer carrying direction in the developer stirring unit, for mixing the toner collected by the toner recycling section into the developer stirring unit.

31. (Previously presented) An image formation apparatus, comprising:

- an image carrying member; and
- a toner image formation section for forming a toner image by developing an electrostatic image formed on the image carrying member,

wherein the toner image formation section includes the development apparatus of claim 2, and

wherein the following conditions (1) and (2) are satisfied:

Condition (1); $W \geq M H V H L/1000$

Condition (2); $R \leq 600$

where V represents a moving speed (mm/sec) of the image carrying member, M represents a maximum toner amount attaching to one unit area in the toner image formed on the image carrying member (mg/cm^2), L represents a maximum width (mm) of the toner image formed on the image carrying member in a direction perpendicular to a moving direction of the image carrying member, W represents a developer carrying amount (g/sec) by the developer supplying/collecting section in the rotation axis direction, and R represents a rotation number of the developer supplying/collecting section.

32. (Previously presented) An image formation apparatus, comprising:
an image carrying member;
a toner image formation section for forming a toner image by developing an electrostatic image formed on the image carrying member;
a transferring section for transferring the toner image on the image carrying member to a transferring material or an intermediate transferring member;
a cleaning section for removing toner which remains on the image carrying member after the toner image is transferred; and

a toner recycling section for collecting the toner removed from the image carrying member to be reused,

wherein the toner image formation section includes the development apparatus of claim 2, and

wherein in the housing of the development apparatus, a recycled toner mixing opening is formed above the position where the first and second developer stirring sections face each other and at the upstream side with respect to the toner supplying opening in the first developer carrying direction in the developer stirring unit, for mixing the toner collected by the toner recycling section into the developer stirring unit.

33. (Withdrawn) An image formation apparatus comprising a latent image carrying member and a toner image formation section for forming a toner image by developing an electrostatic latent image formed on the latent image carrying member,

wherein the toner image formation section includes the development apparatus of claim 11, and

following conditions (1) and (2) are satisfied:

Condition (1); $W \geq M H V H L / 1000$

Condition (2); $R \leq 600$

where V represents a moving speed (mm/sec) of the latent image carrying member, M represents maximum toner amount attaching to one unit area in the toner image formed on the latent image carrying member (mg/cm^2), L represents maximum width (mm) of the toner image formed on the latent image carrying member in a direction perpendicular to a moving direction of the latent image carrying member, W

represents developer carrying amount (g/sec) by the developer supplying/collecting section in the rotation axis direction, and R represents rotation number of the developer supplying/collecting section.

34. (Withdrawn) An image formation apparatus comprising a latent image carrying member, a toner image formation section for forming a toner image by developing an electrostatic latent image formed on the latent image carrying member, a transferring section for transferring the toner image on the latent image carrying member to transferring material or an intermediate transferring member, a cleaning section for removing toner remained on the latent image carrying member after the toner image is transferred, and a toner recycling section for collecting the toner removed from the latent image carrying member to be reused,

wherein the toner image formation section includes the development apparatus of claim 11, and

in the housing structuring the development apparatus, a recycled toner mixing opening is placed above the position where the two developer stirring sections face each other and at an upstream side with respect to the toner supplying opening in the developer carrying direction in the developer stirring unit, for mixing the toner collected by the toner recycling section into the developer stirring unit.

35. (Withdrawn) An image formation apparatus comprising a latent image carrying member and a toner image formation section for forming a toner image by developing an electrostatic latent image formed on the latent image carrying member,

wherein the toner image formation section includes the development apparatus of claim 20, and

following conditions (1) and (2) are satisfied:

$$\text{Condition (1);} \quad W \geq M H V H L/1000$$

$$\text{Condition (2);} \quad R \leq 600$$

where V represents a moving speed (mm/sec) of the latent image carrying member, M represents maximum toner amount attaching to one unit area in the toner image formed on the latent image carrying member (mg/cm^2), L represents maximum width (mm) of the toner image formed on the latent image carrying member in a direction perpendicular to a moving direction of the latent image carrying member, W represents developer carrying amount (g/sec) by the developer supplying/collecting section in the rotation axis direction, and R represents rotation number of the developer supplying/collecting section.

36. (Withdrawn) An image formation apparatus comprising a latent image carrying member, a toner image formation section for forming a toner image by developing an electrostatic latent image formed on the latent image carrying member, a transferring section for transferring the toner image on the latent image carrying member to transferring material or an intermediate transferring member, a cleaning section for removing toner remained on the latent image carrying member after the toner image is transferred, and a toner recycling section for collecting the toner removed from the latent image carrying member to be reused,

wherein the toner image formation section includes the development apparatus of claim 20, and

in the housing structuring the development apparatus, a recycled toner mixing opening is placed above the position where the two developer stirring sections face each other and at an upstream side with respect to the toner supplying opening in the developer carrying direction in the developer stirring unit, for mixing the toner collected by the toner recycling section into the developer stirring unit.

37. (Previously presented) The apparatus of claim 1, wherein peripheries of the developer carrying member and the developer supplying/collecting section move in opposite directions with respect to each other at a position where the developer carrying member and the developer supplying/collecting section face each other.

38. (Previously presented) The apparatus of claim 2, wherein peripheries of the developer carrying member and the developer supplying/collecting section move in opposite directions with respect to each other at a position where the developer carrying member and the developer supplying/collecting section face each other.

39. (Withdrawn) The apparatus of claim 11, wherein, in the developer supplying/collecting unit, peripheries of the developer carrying member and the developer supplying/collecting section are moved in opposite directions to each other at a position where the developer carrying member and the developer supplying/collecting section face each other.

40. (Withdrawn) The apparatus of claim 20, wherein, in the developer supplying/collecting unit, peripheries of the developer carrying member and the developer supplying/collecting section are moved in opposite directions to each other at a position where the developer carrying member and the developer supplying/collecting section face each other.

41. (Previously presented) The apparatus of claim 1, wherein the housing includes a partition between the developer supplying/collecting unit and the developer stirring unit to avoid mixing the developer therein, the developer moves to edge portions of both the developer supplying/collecting unit and the developer stirring unit in a longitudinal direction; and

a space is formed between the first and second developer stirring sections to allow the developer to freely circulate between the first and second developer stirring sections.

42. (Previously presented) The apparatus of claim 2, wherein the housing includes a partition between the developer supplying/collecting unit and the developer stirring unit to avoid mixing the developer therein, the developer moves to edge portions of both the developer supplying/collecting unit and the developer stirring unit in a longitudinal direction; and

a space is formed between the first and second developer stirring sections to allow the developer to freely circulate between the first and second developer stirring sections.

43. (Withdrawn) The apparatus of claim 11, wherein, in the housing, there is a partition between the developer supplying/collecting unit and the developer stirring unit for separating space so as to avoid mixing the developer in the developer supplying/collecting unit and the developer in the developer stirring unit;

the partition enables the developer in both the developer supplying/collecting unit and the developer stirring unit to move to each other at both edge parts in a longitudinal direction of both the developer supplying/collecting unit and the developer stirring unit; and

a space is secured between the two developer stirring section in the developer stirring unit so as to make the developer circulate between the two developer stirring sections freely.

44. (Withdrawn) The apparatus of claim 20, wherein, in the housing, there is a partition between the developer supplying/collecting unit and the developer stirring unit for separating space so as to avoid mixing the developer in the developer supplying/collecting unit and the developer in the developer stirring unit;

the partition enables the developer in both the developer supplying/collecting unit and the developer stirring unit to move to each other at both edge parts in a longitudinal direction of both the developer supplying/collecting unit and the developer stirring unit; and

a space is secured between the two developer stirring section in the developer stirring unit so as to make the developer circulate between the two developer stirring sections freely.